(C) AMENDMENTS TO THE CLAIMS

1. (Currently amended) A method for deghosting and water surface multiple reflection attenuation in dual sensor marine seismic data, comprising:

utilizing a spatial Fourier transform to transform data acquired at each of a plurality of source positions into the spatial Fourier domain;

decomposing the transformed data ~~acquired at each of a plurality of source positions~~ into upgoing and downgoing wavefield components using a measured parameter related to pressure and measured parameter related to vertical particle motion; and

determining a substantially multiple-free wavefield from the decomposed wavefield components independently of knowledge of a source wavelet.

2. (Original) The method of claim 1 wherein the data are acquired at a plurality of spaced apart locations at a selected depth below the water surface using a dual sensor streamer.

3. (Original) The method of claim 2 wherein the selected depth is below a depth of a seismic energy source.

4. (Original) The method of claim 1 wherein the data are acquired using an ocean bottom cable.

5. (Original) The method of claim 1 wherein the parameter related to pressure comprises change in pressure with respect to time.

6. (Original) The method of claim 1 wherein the parameter related to vertical particle motion comprises particle velocity.

7. (Original) The method of claim 1 wherein the parameter related to vertical particle motion comprises the particle acceleration.

8. (Original) The method of claim 1 wherein the determining the substantially multiple free wavefield comprises solving a system of equations for measured total wavefield and measured multiple free wavefield at the plurality of source positions.

9. (Original) The method of claim 1 further comprising determining a source wavelet from the decomposed wavefield components.

10. (Currently amended) A method for deghosting marine seismic data, the data comprising a vertical component of parameter related to particle motion and a parameter related to pressure, the measurements related to pressure and particle motion substantially collocated and made at a plurality of spaced apart positions, the method comprising:

transforming the data by the spatial Fourier transform into the spatial Fourier domain;

separating an upgoing wavefield component of the transformed data in the spatial Fourier domain; and

inverse transforming the upgoing component into the spatial frequency domain.

11. (Original) The method of claim 10 wherein the parameter related to pressure comprises change in pressure with respect to time.

12. (Original) The method of claim 10 wherein the parameter related to vertical particle motion comprises particle velocity.

13. (Original) The method of claim 10 wherein the parameter related to vertical particle motion comprises the particle acceleration.

14. (Original) The method of claim 10 wherein the data are acquired at a selected depth below the surface of the body of water using a dual sensor streamer.

15. (Original) The method of claim 10 wherein the data are acquired using an ocean bottom cable.

16. (Currently amended) A method for seismic exploration, comprising:

actuating a seismic energy source in a body of water at a plurality of positions;

measuring a parameter related to pressure at a plurality of locations at a selected depth below the surface of the body of water;

measuring a parameter related to a vertical component of particle motion at substantially the same locations as measuring the parameter related to pressure;

utilizing a spatial Fourier transform to transform measurements acquired at each of said plurality of positions into the spatial Fourier domain;

decomposing the transformed measurements of the pressure related parameter and particle motion parameter ~~acquired at each of the plurality of source positions~~ into upgoing and downgoing wavefield components; and

determining a substantially multiple-free wavefield from the decomposed wavefield components independently of knowledge of a source wavelet.

17. (Original) The method of claim **16** wherein the selected depth is below a depth at which the seismic energy source is actuated.

18. (Original) The method of claim **16** wherein the parameter related to pressure comprises change in pressure with respect to time.

19. (Original) The method of claim **16** wherein the parameter related to vertical particle motion comprises particle velocity.

20. (Original) The method of claim **16** wherein the parameter related to vertical particle motion comprises the particle acceleration.

21. (Original) The method of claim **16** wherein the determining the multiple free wavefield comprises solving a system of equations for measured total wavefield and multiple free wavefield at the plurality of source positions.

22. (Currently amended) The method of claim **16** wherein the decomposing comprises:

~~transforming the data into the spatial Fourier domain;~~

~~separating an upgoing wavefield component of the transformed data in the spatial Fourier domain; and~~

inverse transforming the upgoing component into the spatial frequency domain.

23. (Original) The method of claim **16** further comprising determining a source wavelet from the decomposed wavefield components.

24. (Original) The method of claim **16** wherein the data are acquired using a dual sensor streamer.

25. (Original) The method of claim **16** wherein the data are acquired using an ocean bottom cable.

26. (Currently amended) A computer program stored in a computer readable medium, the program containing logic operable to cause a programmable computer to perform steps comprising:

utilizing a spatial Fourier transform to transform seismic signals acquired at each of a plurality of seismic energy source positions into the spatial Fourier domain;

decomposing the transformed seismic signals ~~acquired at each of a plurality of seismic energy source positions~~ into upgoing and downgoing wavefield components using a measured parameter related to pressure and measured parameter related to vertical particle motion; and

determining a substantially multiple-free wavefield from the decomposed wavefield components independently of knowledge of a source wavelet.

27. (Original) The program of claim **26** wherein the seismic signals are acquired at a plurality of spaced apart locations at a selected depth below a water surface.

28. (Original) The program of claim **26** wherein the selected depth is below a depth at which a seismic energy source is disposed.

29. (Original) The program of claim **26** wherein the parameter related to pressure comprises change in pressure with respect to time.

30. (Original) The program of claim **26** wherein the parameter related to vertical particle motion comprises particle velocity.

31. (Original) The program of claim **26** wherein the parameter related to vertical particle motion comprises the particle acceleration.

32. (Original) The program of claim **26** wherein the logic comprises instructions to cause the computer to perform solving a system of equations for measured total wavefield and measured multiple free wavefield at the plurality of source positions.

33. (Currently amended) A method for seismic exploration, comprising:

towing at least one seismic energy source in a body of water;

towing at least one seismic streamer at a selected depth in the body of water, the streamer having a plurality of sensor sets thereon, each of the plurality of sensor sets having thereon a first sensor adapted to measure a parameter related to pressure of the water and a second sensor adapted to measure a parameter related to a vertical component of particle motion at substantially the same locations as first sensor;

actuating the seismic energy source at a plurality of positions in the water;

measuring signals generated by each of the first and second sensors in the sensor sets in response to each of the actuations of the source;

<u>utilizing a spatial Fourier transform to transform the measured signals acquired at each of the plurality of positions into the spatial Fourier domain;</u>

decomposing the <u>transformed</u> measurements of the pressure related parameter and particle motion parameter ~~acquired at each of the plurality of source positions~~ into upgoing and downgoing wavefield components; and

determining a substantially multiple-free wavefield from the decomposed wavefield components independently of knowledge of a source wavelet.

34. (Original) The method of claim **33** wherein the selected depth is below a depth at which the seismic energy source is actuated.

35. (Original) The method of claim **33** wherein the parameter related to pressure comprises change in pressure with respect to time.

36. (Original) The method of claim **33** wherein the parameter related to vertical particle motion comprises particle velocity.

37. (Original) The method of claim **33** wherein the parameter related to vertical particle motion comprises the particle acceleration.

38. (Original) The method of claim **33** wherein the determining the multiple free wavefield comprises solving a system of equations for measured total wavefield and multiple free wavefield at the plurality of source positions.

39. (Canceled)

40. (Previously presented) The method of claim **33** further comprising:

deploying at least one ocean bottom cable having a plurality of substantially collocated sensor pairs at spaced apart positions thereon, the sensor pairs including a sensor responsive to a parameter related to pressure and a sensor responsive to particle motion;

measuring signals generated by each of the sensors in the sensor pairs in response to each of the actuations of the source;

decomposing the measurements of the pressure related parameter and particle motion parameter acquired at each of the plurality of source positions into upgoing and downgoing wavefield components; and

determining a substantially multiple-free wavefield from the decomposed wavefield components independently of knowledge of a source wavelet.

41–42. (Canceled)